



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

ATTY.'S DOCKET: MUKAI=1

In re Application of:) Art Unit:
Hiroyuki MUKAI et al.)
Serial No.: 09/935,338) Examiner:
Filed: August 23, 2001) Washington, D.C.
For: METHOD FOR AMPLIFYING)
NUCLEIC ACID SEQUENCE)
)
)

PRELIMINARY AMENDMENT

Honorable Commissioner of Patents
Washington, D.C. 20231

Sir:

Prior to calculation of the filing fee including
additional claims, please amend as follows:

IN THE CLAIMS

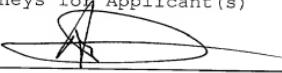
Please cancel claims 2-220 without prejudice.

REMARKS

The above amendments to the claims is being made in order to eliminate multiple dependency and for the purpose of diminishing the filing fee.

Respectfully submitted,

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NUCLEIC ACID SEQUENCE) January 17, 2002
)
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SUPPLEMENTAL PRELIMINARY AMENDMENT

Honorable Commissioner of Patents
Washington, D.C. 20231

Sir:

Prior to examination on the merits, please amend as follows:

IN THE CLAIMS

Please cancel claim 1 without prejudice and add new claims 221-331.

--221(New). A method for amplifying a nucleic acid, characterized in that the method comprises:

(a) preparing a reaction mixture by mixing a nucleic acid as a template, a deoxyribonucleotide triphosphate, a DNA polymerase having a strand displacement activity, at least one primer and an endonuclease that cleaves an extended strand generated from the primer, wherein the primer is a chimeric oligonucleotide primer

that is substantially complementary to the nucleotide sequence of the nucleic acid as the template and contains a ribonucleotide as well as at least one selected from the group consisting of a deoxyribonucleotide and a nucleotide analog, the ribonucleotide being positioned at the 3'-terminus or on the 3'-terminal side of the primer; and

(b) incubating the reaction mixture for a sufficient time to generate a reaction product.--

--222(New). The method according to claim 221, wherein the reaction mixture is incubated isothermally.--

--223(New). The method according to claim 221, wherein the reaction mixture further contains a chimeric oligonucleotide primer having a sequence substantially homologous to the nucleotide sequence of the nucleic acid as the template.--

--224 (New). The method according to claim 221, wherein the DNA polymerase is selected from the group consisting of Klenow fragment of DNA polymerase I from *Escherichia coli*, *Bst* DNA polymerase lacking 5'→3' exonuclease from *Bacillus stearothermophilus* and *Bca* DNA polymerase lacking 5'→3' exonuclease from *Bacillus caldovenax*.--

--225(New). The method according to claims 221, wherein the endonuclease is an endoribonuclease.--

--226(New). The method according to claim 225, wherein the endoribonuclease is RNase H.--

--227(New). The method according to claim 226, wherein the RNase H is selected from the group consisting of an RNase H from *Escherichia coli*, an RNase H from a bacterium of genus *Thermotoga*, an RNase H from a bacterium of genus *Thermus*, an RNase H from a bacterium of genus *Pyrococcus*, an RNase H from a bacterium of genus *Archaeoglobus* and an RNase H from a bacterium of genus *Bacillus*.

--228. The method according to claim 221, wherein the DNA polymerase having a strand displacement activity is Bca DNA polymerase lacking 5'→3' exonuclease from *Bacillus caldotenax* and the RNase H as an endonuclease is selected from the group consisting of an RNase H from *Escherichia coli*, an RNase H from a bacterium of genus *Pyrococcus* and an RNase H from a bacterium of genus *Archaeoglobus*.--

--229(New). The method according to claim 228, wherein the RNase H is type I RNase H from *Escherichia coli*, or type II RNase H from a bacterium of genus *Pyrococcus* or a bacterium of genus *Archaeoglobus*.--

--230(New). The method according to claim 221, wherein a DNA polymerase having an endonuclease activity is used.--

--231(New). The method according to claim 230, wherein the DNA polymerase is Bca DNA polymerase lacking 5'→3' exonuclease from *Bacillus caldotenax* and the Bca DNA polymerase is used in the presence of a substance that allows the endonuclease activity of the Bca DNA polymerase to express.--

--232(New). The method according to claim 231, wherein the substance that allows the endonuclease activity of the DNA polymerase to express is a manganese ion.--

--233(New). The method according to claim 221, wherein the amplification reaction is conducted in the presence of a substance that inhibits the reverse transcription activity of the DNA polymerase.--

--234(New). The method according to claim 233, wherein the substance that inhibits the reverse transcription activity of the DNA polymerase is phosphonoformic acid.--

--235(New). The method according to claim 221, wherein the chimeric oligonucleotide primer contains two or more successive ribonucleotide residues.--

--236(New). The method according to claim 221, wherein the chimeric oligonucleotide primer contains one or more modified ribonucleotide.--

--237(New). The method according to claim 236, wherein the chimeric oligonucleotide primer contains an (α -S) ribonucleotide in which the oxygen atom bound to the phosphorous atom at the α -position of the ribonucleotide is replaced by a sulfur atom.--

--238(New). The method according to claim 221, wherein a chimeric oligonucleotide primer represented by general formula below is used:

General formula: 5'-dNa-Nb-dNc-3'

(a: an integer of 11 or more; b: an integer of 1 or more; c: 0

or an integer of 1 or more; dN: deoxyribonucleotide and/or nucleotide analog; N: unmodified ribonucleotide and/or modified ribonucleotide, wherein some of dNs in dNa may be replaced by Ns, and the nucleotide at the 3'-terminus may be modified such that extension from the 3'-terminus by the action of the DNA polymerase does not take place).--

--239(New). The method according to claim 238, wherein c is 0.--

--240(New). The method according to claim 238, wherein the nucleotide analog is deoxyriboinosine nucleotide or deoxyribouracil nucleotide, and the modified ribonucleotide is (α -S) ribonucleotide.--

--241(New). The method according to claim 238, wherein the nucleic acid amplification reaction is conducted at a temperature suitable for the chimeric oligonucleotide primer as defined in claim 238.--

--242(New). The method according to claim 221, wherein the chimeric oligonucleotide primer is at least one chimeric oligonucleotide primer selected from the group consisting of:

a) a chimeric oligonucleotide primer for detecting enterohemorrhagic *Escherichia coli* having a nucleotide sequence selected from the group consisting of SEQ ID NOS: 31 to 34, 47, 48, 51-53, 64-72, 84, 85, 113, 114, 130 and 131;

b) a chimeric oligonucleotide primer for detecting a viroid having a nucleotide sequence selected from the group

consisting of SEQ ID NOS: 59, 60, 119, 120, 122 and 123;

c) a chimeric oligonucleotide primer for detecting Clostridium botulinum having a nucleotide sequence represented by SEQ ID NO: 116 or 117;

d) a chimeric oligonucleotide primer for detecting papilloma virus having a nucleotide sequence represented by SEQ ID NO: 96 or 97;

e) a chimeric oligonucleotide primer for detecting hepatitis C virus having a nucleotide sequence selected from the group consisting of SEQ ID NOS: 101, 102, 138, 139, 200, 201, 205 and 206;

f) a chimeric oligonucleotide primer for detecting Staphylococcus aureus having a nucleotide sequence represented by SEQ ID NO: 136 or 137;

g) a chimeric oligonucleotide primer for detecting Mycobacterium tuberculosis having a nucleotide sequence selected from the group consisting of SEQ ID NOS: 155, 156, 159 to 162, 194 and 195; and

h) a chimeric oligonucleotide primer for detecting Chlamydia having a nucleotide sequence selected from the group consisting of SEQ ID NOS: 157, 158, 203 and 204.--

--243(New). The method according to claim 221, which is conducted in a buffer that contains a buffering component selected from the group consisting of Tricine, a phosphate, tris, Bicine and HEPES.--

--244(New). The method according claim 221, wherein

the nucleic acid as the template is a single-stranded DNA or a double-stranded DNA.--

--245(New). The method according to claim 244, which is conducted after converting a double-stranded DNA as the template into single-stranded DNAs.--

--246(New). The method according to claim 244, wherein the nucleic acid as the template is a cDNA obtained from an RNA by a reverse transcription reaction.--

--247(New). The method according to claim 246, which is conducted after synthesizing a cDNA by a reverse transcription reaction using an RNA as a template.--

--248(New). The method according to claim 247, wherein a primer selected from the group consisting of an oligo-dT primer, a random primer and a specific primer is used as a primer for the reverse transcription reaction.--

--249(New). The method according to claim 247, wherein a chimeric oligonucleotide primer is used as a primer for the reverse transcription reaction.--

--250(New). The method according to claim 247, wherein a DNA polymerase having a reverse transcriptase activity is used as a reverse transcriptase.--

--251(New). The method according to claim 247, wherein the reverse transcription reaction and the nucleic acid amplification reaction are conducted using one DNA polymerase having a reverse transcriptase activity and a strand displacement activity.--

--252(New). The method according to claim 251, wherein the DNA polymerase is Bst DNA polymerase lacking 5'→3' exonuclease from *Bacillus stearothermophilus* or Bca DNA polymerase lacking 5'→3' exonuclease from *Bacillus caldogenax*.

--253(New). The method according to claim 246, wherein the RNA as the template in the reverse transcription reaction is an RNA amplified by an additional nucleic acid amplification reaction.

--254(New). The method according to claim 253, which is conducted after synthesizing an amplified RNA fragment by an additional nucleic acid amplification reaction using an RNA as a template.

--255(New). The method according to claim 253, wherein the additional nucleic acid amplification reaction is selected from the group consisting of the transcription-based amplification system (TAS) method, the self-sustained sequence replication (3SR) method, the nucleic acid sequence-based amplification (NASBA) method, the transcription-mediated amplification (TMA) method and the Q β replicase method.

--256(New). The method according to claim 244, wherein the nucleic acid as the template is a DNA obtained by an additional nucleic acid amplification reaction.

--257(New). The method according to claim 256, which is conducted after synthesizing an amplified DNA fragment by an additional nucleic acid amplification reaction using an DNA as a template.

--258(New). The method according to claim 256, wherein the additional nucleic acid amplification reaction is selected from the group consisting of the polymerase chain reaction (PCR) method, the ligase chain reaction (LCR) method and the strand displacement amplification (SDA) method.

--259(New). The method according to claim 253, wherein a random primer or a degenerate primer is used for the additional nucleic acid amplification reaction.

--260(New). The method according to claim 259, wherein the random primer or the degenerate primer is a primer having a random sequence or a degenerate sequence at least at the 3'-terminus or on the 3'-terminal side.

--261(New). The method according to claim 256, wherein a random primer or a degenerate primer is used for the additional nucleic acid amplification reaction.

--262(New). The method according to claim 261, wherein the random primer or the degenerate primer is a primer having a random sequence or a degenerate sequence at least at the 3'-terminus or on the 3'-terminal side.

--263(New). The method according to claim 221, wherein the length of the region of the nucleic acid to be amplified is 200 bp or shorter.

--264(New). The method according to claim 221, which comprises annealing the nucleic acid as the template to the chimeric oligonucleotide primer that is substantially complementary to the nucleotide sequence of the nucleic acid in

an annealing solution containing a substance that enhances the annealing of the nucleic acid to the primer.

--265(New). The method according to claim 264, wherein the annealing solution contains spermidine and/or propylenediamine.

--266(New). The method according to claim 264, wherein the annealing is conducted by incubating the annealing solution containing the nucleic acid as the template and the chimeric oligonucleotide primer that is substantially complementary to the nucleotide sequence of the nucleic acid at 90°C or above and then cooling the solution to a temperature at which the amplification reaction is conducted or below.

--267(New). The method according to claim 221, wherein the nucleic acid amplification reaction is conducted in the presence of a deoxyribonucleotide triphosphate analog.

--268(New). The method according to claim 267, wherein the deoxyribonucleotide triphosphate analog is deoxyuridine triphosphate or a derivative thereof.

--269(New). The method according to claim 221, wherein a template switching reaction is effected.

--270(New). The method according to claim 221, which further comprises a step of duplicating a DNA or an RNA containing a sequence to be amplified to prepare a nucleic acid as a template prior to step (a), wherein the duplicated nucleic acid is used in step (a) as a nucleic acid as a template.

--271(New). A method for producing a nucleic acid in large quantities, characterized in that the method comprises:

(a) amplifying a nucleic acid by the method defined by claim 221; and

(b) collecting the nucleic acid amplified in step (a).

--272(New). A method for detecting a target nucleic acid in a sample, characterized in that the method comprises:

(a) amplifying a target nucleic acid by the method defined by claim 221; and

(b) detecting the target nucleic acid amplified in step (a).

--273(New). The method according to claim 272, which comprises detecting the amplified nucleic acid using a probe for detection.

--274(New). The method according to claim 273, wherein the probe for detection is a probe that has been labeled with a labeling substance.

--275(New). The method according to claim 274, wherein the probe is an RNA probe labeled with two or more fluorescent substances positioned at a distance that results in a quenching state.

--276(New). The method according to claim 273, wherein the probe is a probe which hybridizes to a region amplified using at least one chimeric oligonucleotide primer selected from the group consisting of:

a) a chimeric oligonucleotide primer for detecting enterohemorrhagic Escherichia coli having a nucleotide sequence selected from the group consisting of SEQ ID NOS: 31 to 34, 47, 48, 51-53, 64-72, 84, 85, 113, 114, 130 and 131;

b) a chimeric oligonucleotide primer for detecting a viroid having a nucleotide sequence selected from the group consisting of SEQ ID NOS: 59, 60, 119, 120, 122 and 123;

c) a chimeric oligonucleotide primer for detecting Clostridium botulinum having a nucleotide sequence represented by SEQ ID NO: 116 or 117;

d) a chimeric oligonucleotide primer for detecting papilloma virus having a nucleotide sequence represented by SEQ ID NO: 96 or 97;

e) a chimeric oligonucleotide primer for detecting hepatitis C virus having a nucleotide sequence selected from the group consisting of SEQ ID NOS: 10221, 102, 138, 139, 200, 201, 205 and 206;

f) a chimeric oligonucleotide primer for detecting Staphylococcus aureus having a nucleotide sequence represented by SEQ ID NO: 136 or 137;

g) a chimeric oligonucleotide primer for detecting Mycobacterium tuberculosis having a nucleotide sequence selected from the group consisting of SEQ ID NOS: 155, 156, 159 to 162, 194 and 195; and

h) a chimeric oligonucleotide primer for detecting Chlamydia having a nucleotide sequence selected from the group

consisting of SEQ ID NOS: 157, 158, 203 and 204.

--277 (New). A method for determining a nucleotide sequence of a nucleic acid, characterized in that the method comprises:

(a) amplifying a nucleic acid by the method defined by claim 221; and

(b) determining the nucleotide sequence of the nucleic acid amplified in step (a).

--278 (New). A method for preparing a single-stranded nucleic acid, the method comprising generating a single-stranded nucleic acid using the method defined by claim 221.

--279 (New). The method according to claim 278, wherein at least two primers at different concentrations are used.

--280 (New). A kit used for the method defined by claim 221, which is in a packaged form and contains instructions that direct the use of a DNA polymerase and an endonuclease.

--281 (New). The kit according to claim 280, which further contains at least one selected from the group consisting of:

(a) a DNA polymerase having a strand displacement activity;

(b) an endonuclease; and

(c) a buffer.

--282 (New). A kit used for the method for detecting a target nucleic acid defined by claim 272, which is in a packaged

form and contains instructions that direct the use of a DNA polymerase and an endonuclease in a strand displacement reaction.

--283(New). The kit according to claim 282, which contains at least one selected from the group consisting of:

(a) a DNA polymerase having a strand displacement activity;

(b) an endonuclease; and

(c) a buffer.

--284(New). A composition for amplifying a nucleic acid used for the method for amplifying a nucleic acid defined by claim 221, which contains:

(a) an endonuclease; and

(b) a DNA polymerase having a strand displacement activity.

--285(New). The composition according to claim 284, which further contains at least one primer that is substantially complementary to a nucleotide sequence of a nucleic acid as a template, wherein the primer is a chimeric oligonucleotide primer that contains a ribonucleotide as well as at least one selected from the group consisting of a deoxyribonucleotide and a nucleotide analog, the ribonucleotide being positioned at the 3'-terminus or on the 3'-terminal side of the primer.

--286(New). The composition according to claim 284, which contains a buffering component suitable for a nucleic acid amplification reaction.

--287(New). A chimeric oligonucleotide primer used for the method for amplifying a nucleotide sequence defined by claim 221, which is substantially complementary to the nucleotide sequence of the nucleic acid as the template and contains a ribonucleotide as well as at least one selected from the group consisting of a deoxyribonucleotide and a nucleotide analog, the ribonucleotide being positioned at the 3'-terminus or on the 3'-terminal side of the primer.

--288(New). A chimeric oligonucleotide primer used for the method for detecting a target nucleic acid defined by claim 272, which is substantially complementary to the nucleotide sequence of the nucleic acid as the template and contains a ribonucleotide as well as at least one selected from the group consisting of a deoxyribonucleotide and a nucleotide analog, the ribonucleotide being positioned at the 3'-terminus or on the 3'-terminal side of the primer.

--289(New). The chimeric oligonucleotide primer according to claim 288, which is a chimeric oligonucleotide primer for detecting a pathogenic microorganism or a disease-related gene.

--290(New). The chimeric oligonucleotide primer according to claim 289, wherein the pathogenic microorganism is *enterohemorrhagic Escherichia coli*, *Clostridium botulinum*, *Staphylococcus aureus*, *Mycobacterium tuberculosis*, *Chlamydia*, *papilloma virus*, *hepatitis C virus* or a viroid.

--291(New). A method for producing a material having an immobilized nucleic acid in which the nucleic acid is arrayed in a predefined region, characterized in that the method comprises:

(a) amplifying a nucleic acid to be immobilized by the method defined by claim 221; and

(b) arraying and immobilizing the nucleic acid amplified in step (a) in a predefined region on a substrate.

--292(New). The method according to claim 291, wherein a single-stranded nucleic acid substantially free of a complementary strand thereto is amplified, and arrayed and immobilized in the predefined region on the substrate.

--293(New). A material having an immobilized nucleic acid in which the nucleic acid is arrayed in a predefined region produced by the method defined by claim 291.--

--294(New). The material according to claim 293, wherein a single-stranded nucleic acid is arrayed and immobilized in the predefined region.--

--295(New). The material according to claim 294, in which a single-stranded nucleic acid substantially free of a complementary strand thereto is arrayed and immobilized in the predefined region.--

--296(New). A method for detecting a target nucleic acid in a sample, characterized in that the method comprises:

(a) preparing a nucleic acid sample suspected to contain a target nucleic acid from a sample;

(b) contacting the nucleic acid sample with the material defined by claim 293; and

(c) detecting the target nucleic acid in the nucleic acid sample that hybridizes with the nucleic acid on the material.--

--297(New). A product of a reagent for amplifying a nucleic acid according to the method defined by claim 221, which consists of a packing material and a reagent for amplifying a nucleic acid enclosed in the packing material, wherein the reagent for amplifying a nucleic acid contains a DNA polymerase having a strand displacement activity and/or an endonuclease, and description that the reagent for amplifying a nucleic acid can be used for nucleic acid amplification under isothermal conditions is indicated in a label stuck to the packaging material or instructions attached to the packaging material.--

--298(New). A method for amplifying a nucleotide sequence, characterized in that the method comprises:

(a) treating a nucleic acid as a template with at least one primer that is substantially complementary to the nucleotide sequence of the nucleic acid and a DNA polymerase to synthesize a primer-extended strand that is complementary to the template, wherein the primer is a chimeric oligonucleotide primer containing a deoxyribonucleotide and a ribonucleotide, the ribonucleotide being positioned at the 3'-terminus or on the 3'-terminal side of the primer for cleavage with an endonuclease;

(b) cleaving the primer-extended strand of a double-stranded nucleic acid obtained in step (a) with the endonuclease at a site that contains the ribonucleotide; and

(c) extending a nucleotide sequence that is complementary to the template using a DNA polymerase having a strand displacement activity from the 3'-terminus of the primer portion of the double-stranded nucleic acid in which the primer-extended strand is cleaved obtained in step (b) to effect a strand displacement.--

--299(New). The method according to claim 298,
wherein step (b) and step (c) are sequentially repeated.--

--300(New). The method according to claim 298,
wherein one DNA polymerase having a strand displacement activity
is used.--

--301(New). A method for amplifying a nucleotide sequence using at least two primers, characterized in that the method comprises:

(a) treating a nucleic acid as a template with at least one primer that is substantially complementary to the nucleotide sequence of the nucleic acid and a DNA polymerase to synthesize a primer-extended strand that is complementary to the template, wherein the primer is a chimeric oligonucleotide primer containing a deoxyribonucleotide and a ribonucleotide, the ribonucleotide being positioned at the 3'-terminus or on the 3'-terminal side of the primer for cleavage with an endonuclease;

(b) cleaving the primer-extended strand of a double-stranded nucleic acid obtained in step (a) with the endonuclease at a site that contains the ribonucleotide;

(c) extending a nucleotide sequence that is complementary to the template using a DNA polymerase having a strand displacement activity from the 3'-terminus of the primer portion of the double-stranded nucleic acid in which the primer-extended strand is cleaved obtained in step (b) to effect a strand displacement, wherein a double-stranded nucleic acid containing a regenerated primer-extended strand is reused in step (b);

(d) treating a released displaced strand obtained in step (c) as a template with at least one primer that is different from that used in step (a) and a DNA polymerase to synthesize a primer-extended strand that is complementary to the displaced strand, wherein the primer that is different from that used in step (a) is a chimeric oligonucleotide primer that is substantially complementary to the nucleotide sequence of the displaced strand and contains a deoxyribonucleotide and a ribonucleotide, the ribonucleotide being positioned at the 3'-terminus or on the 3'-terminal side of the primer for cleavage with an endonuclease;

(e) cleaving the primer-extended strand of a double-stranded nucleic acid obtained in step (d) with the endonuclease at a site that contains the ribonucleotide; and

(f) extending a nucleotide sequence that is

complementary to the template using a DNA polymerase having a strand displacement activity from the 3'-terminus of the primer portion of the double-stranded nucleic acid in which the primer-extended strand is cleaved obtained in step (e) to effect a strand displacement, wherein a double-stranded nucleic acid containing a regenerated primer-extended strand is reused in step (e).--

--302(New). The method according to claim 301, wherein one DNA polymerase having a strand displacement activity is used.--

--303(New). A method for amplifying a nucleotide sequence, characterized in that the method comprises:

(a) amplifying a nucleic acid containing a sequence to be amplified by a nucleic acid amplification reaction to prepare a nucleic acid as a template;

(b) treating the nucleic acid as the template obtained in step (a) with at least one primer that is substantially complementary to the nucleotide sequence of the nucleic acid and a DNA polymerase to synthesize a primer-extended strand that is complementary to the template, wherein the primer is a chimeric oligonucleotide primer containing a deoxyribonucleotide and a ribonucleotide, the ribonucleotide being positioned at the 3'-terminus or on the 3'-terminal side of the primer for cleavage with an endonuclease;

(c) cleaving the primer-extended strand of a double-stranded nucleic acid obtained in step (b) with the endonuclease

at a site that contains the ribonucleotide; and

(d) extending a nucleotide sequence that is complementary to the template using a DNA polymerase having a strand displacement activity from the 3'-terminus of the primer portion of the double-stranded nucleic acid in which the primer-extended strand is cleaved obtained in step (c) to effect a strand displacement.--

--304 (New). A method for amplifying a nucleotide sequence using at least two primers, characterized in that the method comprises:

(a) amplifying a nucleic acid containing a sequence to be amplified by a nucleic acid amplification reaction to prepare a nucleic acid as a template;

(b) treating the nucleic acid as the template obtained in step (a) with at least one primer that is substantially complementary to the nucleotide sequence of the nucleic acid and a DNA polymerase to synthesize a primer-extended strand that is complementary to the template, wherein the primer is a chimeric oligonucleotide primer containing a deoxyribonucleotide and a ribonucleotide, the ribonucleotide being positioned at the 3'-terminus or on the 3'-terminal side of the primer for cleavage with an endonuclease;

(c) cleaving the primer-extended strand of a double-stranded nucleic acid obtained in step (b) with the endonuclease at a site that contains the ribonucleotide;

(d) extending a nucleotide sequence that is

complementary to the template using a DNA polymerase having a strand displacement activity from the 3'-terminus of the primer portion of the double-stranded nucleic acid in which the primer-extended strand is cleaved obtained in step (c) to effect a strand displacement, wherein a double-stranded nucleic acid containing a regenerated primer-extended strand is reused in step (c);

(e) treating a released displaced strand obtained in step (d) as a template with at least one primer that is different from that used in step (b) and a DNA polymerase to synthesize a primer-extended strand that is complementary to the displaced strand, wherein the primer that is different from that used in step (b) is a chimeric oligonucleotide primer that is substantially complementary to the nucleotide sequence of the displaced strand and contains a deoxyribonucleotide and a ribonucleotide, the ribonucleotide being positioned at the 3'-terminus or on the 3'-terminal side of the primer for cleavage with an endonuclease;

(f) cleaving the primer-extended strand of a double-stranded nucleic acid obtained in step (e) with the endonuclease at a site that contains the ribonucleotide; and

(g) extending a nucleotide sequence that is complementary to the template using a DNA polymerase having a strand displacement activity from the 3'-terminus of the primer portion of the double-stranded nucleic acid in which the primer-extended strand is cleaved obtained in step (f) to effect a

strand displacement, wherein a double-stranded nucleic acid containing a regenerated primer-extended strand is reused in step (f).--

--305(New). A method for amplifying a nucleotide sequence, characterized in that the method comprises:

(a) treating a nucleic acid as a template with at least one primer that is substantially complementary to the nucleotide sequence of the nucleic acid and a DNA polymerase to synthesize a primer-extended strand that is complementary to the template, wherein the primer is a chimeric oligonucleotide primer containing a deoxyribonucleotide and a ribonucleotide, the ribonucleotide being positioned at the 3'-terminus or on the 3'-terminal side of the primer;

(b) cleaving the primer-extended strand of a double-stranded nucleic acid obtained in step (a) with an endonuclease at a site that contains the ribonucleotide; and

(c) extending a nucleotide sequence that is complementary to the template using a DNA polymerase having a strand displacement activity from the 3'-terminus of the primer portion of the double-stranded nucleic acid in which the primer-extended strand is cleaved obtained in step (b) to effect a strand displacement.--

--306(New). A method for amplifying a nucleotide sequence using at least two primers, characterized in that the method comprises:

(a) treating a nucleic acid as a template with at

least one primer that is substantially complementary to the nucleotide sequence of the nucleic acid and a DNA polymerase to synthesize a primer-extended strand that is complementary to the template, wherein the primer is a chimeric oligonucleotide primer containing a deoxyribonucleotide and a ribonucleotide, the ribonucleotide being positioned at the 3'-terminus or on the 3'-terminal side of the primer;

(b) cleaving the primer-extended strand of a double-stranded nucleic acid obtained in step (a) with an endonuclease at a site that contains the ribonucleotide;

(c) extending a nucleotide sequence that is complementary to the template using a DNA polymerase having a strand displacement activity from the 3'-terminus of the primer portion of the double-stranded nucleic acid in which the primer-extended strand is cleaved obtained in step (b) to effect a strand displacement, wherein a double-stranded nucleic acid containing a regenerated primer-extended strand is reused in step (b);

(d) treating a released displaced strand obtained in step (c) as a template with at least one primer that is different from that used in step (a) and a DNA polymerase to synthesize a primer-extended strand that is complementary to the displaced strand, wherein the primer that is different from that used in step (a) is a chimeric oligonucleotide primer that is substantially complementary to the nucleotide sequence of the displaced strand and contains a deoxyribonucleotide and a

ribonucleotide, the ribonucleotide being positioned at the 3'-terminus or on the 3'-terminal side of the primer;

(e) cleaving the primer-extended strand of a double-stranded nucleic acid obtained in step (d) with an endonuclease at a site that contains the ribonucleotide; and

(f) extending a nucleotide sequence that is complementary to the template using a DNA polymerase having a strand displacement activity from the 3'-terminus of the primer portion of the double-stranded nucleic acid in which the primer-extended strand is cleaved obtained in step (e) to effect a strand displacement, wherein a double-stranded nucleic acid containing a regenerated primer-extended strand is reused in step (e).--

--307 (New). A method for amplifying a nucleotide sequence, characterized in that the method comprises:

(a) treating a nucleic acid as a template with at least one primer that is substantially complementary to the nucleotide sequence of the nucleic acid and a DNA polymerase to synthesize a primer-extended strand that is complementary to the template, wherein the primer is a chimeric oligonucleotide primer containing a deoxyribonucleotide and a ribonucleotide, the ribonucleotide being positioned at the 3'-terminus or on the 3'-terminal side of the primer, wherein an endonuclease cleaves at a site that contains the ribonucleotide;

(b) cleaving the primer-extended strand of a double-stranded nucleic acid obtained in step (a) with the endonuclease

at the site that contains the ribonucleotide; and

(c) extending a nucleotide sequence that is complementary to the template using a DNA polymerase having a strand displacement activity from the 3'-terminus of the primer portion of the double-stranded nucleic acid in which the primer-extended strand is cleaved obtained in step (b) to effect a strand displacement.--

--308 (New). A method for amplifying a nucleotide sequence using at least two primers, characterized in that the method comprises:

(a) treating a nucleic acid as a template with at least one primer that is substantially complementary to the nucleotide sequence of the nucleic acid and a DNA polymerase to synthesize a primer-extended strand that is complementary to the template, wherein the primer is a chimeric oligonucleotide primer containing a deoxyribonucleotide and a ribonucleotide, the ribonucleotide being positioned at the 3'-terminus or on the 3'-terminal side of the primer, wherein an endonuclease cleaves at a site that contains the ribonucleotide;

(b) cleaving the primer-extended strand of a double-stranded nucleic acid obtained in step (a) with the endonuclease at the site that contains the ribonucleotide;

(c) extending a nucleotide sequence that is complementary to the template using a DNA polymerase having a strand displacement activity from the 3'-terminus of the primer portion of the double-stranded nucleic acid in which the primer-

extended strand is cleaved obtained in step (b) to effect a strand displacement, wherein a double-stranded nucleic acid containing a regenerated primer-extended strand is reused in step (b);

(d) treating a released displaced strand obtained in step (c) as a template with at least one primer that is different from that used in step (a) and a DNA polymerase to synthesize a primer-extended strand that is complementary to the displaced strand, wherein the primer that is different from that used in step (a) is a chimeric oligonucleotide primer that is substantially complementary to the nucleotide sequence of the displaced strand and contains a deoxyribonucleotide and a ribonucleotide, the ribonucleotide being positioned at the 3'-terminus or on the 3'-terminal side of the primer, wherein an endonuclease cleaves at a site that contains the ribonucleotide;

(e) cleaving the primer-extended strand of a double-stranded nucleic acid obtained in step (d) with the endonuclease at the site that contains the ribonucleotide; and

(f) extending a nucleotide sequence that is complementary to the template using a DNA polymerase having a strand displacement activity from the 3'-terminus of the primer portion of the double-stranded nucleic acid in which the primer-extended strand is cleaved obtained in step (e) to effect a strand displacement, wherein a double-stranded nucleic acid containing a regenerated primer-extended strand is reused in step (e).--

--309(New). A method for amplifying a nucleic acid, characterized in that the method comprises:

(a) treating a nucleic acid as a template with at least one primer that is substantially complementary to the nucleotide sequence of the nucleic acid and a DNA polymerase to synthesize a primer-extended strand that is complementary to the template and synthesize a double-stranded nucleic acid, wherein the primer is a chimeric oligonucleotide primer containing a ribonucleotide as well as at least one selected from the group consisting of a deoxyribonucleotide and a nucleotide analog, the ribonucleotide being positioned at the 3'-terminus or on the 3'-terminal side of the primer;

(b) extending a nucleic acid that is complementary to the double-stranded nucleic acid as a template obtained in the previous step using a DNA polymerase having a strand displacement activity in the presence of an RNase H to effect a strand displacement and synthesize a displaced strand and a double-stranded nucleic acid; and

(c) reusing in step (b) the double-stranded nucleic acid obtained in step (b) as a template.--

--310(New). The method according to claim 309, wherein the DNA polymerase is at least one DNA polymerase having a strand displacement activity.--

--311(New). A method for amplifying a nucleic acid using at least two primers, characterized in that the method comprises:

(a) treating a nucleic acid as a template with at least one primer that is substantially complementary to the nucleotide sequence of the nucleic acid and a DNA polymerase to synthesize a primer-extended strand that is complementary to the template, wherein the primer is a chimeric oligonucleotide primer containing a ribonucleotide as well as at least one selected from the group consisting of a deoxyribonucleotide and a nucleotide analog, the ribonucleotide being positioned at the 3'-terminus or on the 3'-terminal side of the primer;

(b) extending a nucleic acid that is complementary to the double-stranded nucleic acid as a template obtained in the previous step using a DNA polymerase having a strand displacement activity in the presence of an RNase H to effect a strand displacement and synthesize a displaced strand and a double-stranded nucleic acid;

(c) reusing in step (b) the double-stranded nucleic acid obtained in step (b) as a template;

(d) treating a displaced strand obtained in step (b) as a template with at least one primer that is different from that used in step (a) and a DNA polymerase to synthesize a primer-extended strand that is complementary to the displaced strand, wherein the primer that is different from that used in step (a) is a chimeric oligonucleotide primer that is substantially complementary to the nucleotide sequence of the displaced strand and contains a ribonucleotide as well as at least one selected from the group consisting of a

deoxyribonucleotide and a nucleotide analog, the ribonucleotide being positioned at the 3'-terminus or on the 3'-terminal side of the primer;

(e) extending a nucleic acid that is complementary to the double-stranded nucleic acid as a template obtained in the previous step using a DNA polymerase having a strand displacement activity in the presence of an RNase H to effect a strand displacement and synthesize a displaced strand and a double-stranded nucleic acid; and

(f) reusing in step (e) the double-stranded nucleic acid obtained in step (e) as a template.--

--312(New). The method according to claim 311, wherein the DNA polymerase is at least one DNA polymerase having a strand displacement activity.--

--313(New). A method for amplifying a nucleic acid, characterized in that the method comprises:

(a) treating a double-stranded nucleic acid as a template with two primers that are substantially complementary to the nucleotide sequences of the respective strands of the double-stranded nucleic acid and a DNA polymerase having a strand displacement activity to synthesize primer-extended strands that are complementary to the template and obtain a double-stranded nucleic acid consisting of the synthesized primer-extended strands being annealed each other, wherein each primer is a chimeric oligonucleotide primer containing a ribonucleotide as well as at least one selected from the group

consisting of a deoxyribonucleotide and a nucleotide analog, the ribonucleotide being positioned at the 3'-terminus or on the 3'-terminal side of the primer;

(b) cleaving the sites that contain the ribonucleotide of the double-stranded nucleic acid consisting of the primer-extended strands obtained in step (a) with the endonuclease; and

(c) extending nucleic acids that are complementary to the template using a DNA polymerase having a strand displacement activity from the 3'-termini of the respective primer portions of the double-stranded nucleic acid in which the primer-extended strands are cleaved obtained in step (b) to effect strand displacements and obtain a double-stranded nucleic acid consisting of the template and the primer-extended strand.--

--314(New). A method for amplifying a nucleic acid, characterized in that the method comprises:

(a) treating a double-stranded nucleic acid as a template with two primers that are substantially complementary to the nucleotide sequences of the respective strands of the double-stranded nucleic acid and a DNA polymerase having a strand displacement activity to synthesize primer-extended strands that are complementary to the template and obtain a double-stranded nucleic acid consisting of the synthesized primer-extended strands being annealed each other, wherein each primer is a chimeric oligonucleotide primer containing a ribonucleotide as well as at least one selected from the group consisting of a deoxyribonucleotide and a nucleotide analog, the

ribonucleotide being positioned at the 3'-terminus or on the 3'-terminal side of the primer;

(b) cleaving the sites that contain the ribonucleotide of the double-stranded nucleic acid consisting of the primer-extended strands obtained in step (a) with the endonuclease; and

(c) extending nucleic acids that are complementary to the template using a DNA polymerase having a strand displacement activity from the 3'-termini of the respective primer portions of the double-stranded nucleic acid in which the primer-extended strands are cleaved obtained in step (b) to effect strand displacements and obtain a double-stranded nucleic acid consisting of the primer-extended strands being annealed each other.--

--315(New). A method for amplifying a nucleic acid, characterized in that the method comprises:

(a) treating a double-stranded nucleic acid as a template with two primers that are substantially complementary to the nucleotide sequences of the respective strands of the double-stranded nucleic acid and a DNA polymerase having a strand displacement activity to synthesize primer-extended strands that are complementary to the template and obtain a double-stranded nucleic acid consisting of the synthesized primer-extended strands being annealed each other, wherein each primer is a chimeric oligonucleotide primer containing a ribonucleotide as well as at least one selected from the group consisting of a deoxyribonucleotide and a nucleotide analog, the

ribonucleotide being positioned at the 3'-terminus or on the 3'-terminal side of the primer;

(b) cleaving the sites that contain the ribonucleotide of the double-stranded nucleic acid consisting of the primer-extended strands obtained in step (a) with the endonuclease;

(c) extending nucleic acids that are complementary to the template using a DNA polymerase having a strand displacement activity from the 3'-termini of the respective primer portions of the double-stranded nucleic acid in which the primer-extended strands are cleaved obtained in step (b) to effect strand displacements and obtain a double-stranded nucleic acid consisting of the primer-extended strands being annealed each other and a double-stranded nucleic acid consisting of the templates being annealed each other to which the two primers in step (a) are annealed;

(d) extending nucleic acids that are complementary to the template using a DNA polymerase having a strand displacement activity from the 3'-termini of the respective primer portions of the double-stranded nucleic acid to which the two primers are annealed obtained in step (c) to effect strand displacements and obtain a double-stranded nucleic acid consisting of the primer-extended strands being annealed each other and a double-stranded nucleic acid consisting of the templates being annealed each other to which the two primers in step (a) are annealed; and

(e) reusing in step (d) the double-stranded nucleic

acid to which the two primers are annealed obtained in step

(d).--

--316(New). A method for amplifying a nucleic acid, characterized in that the method comprises:

(a) treating a double-stranded nucleic acid as a template with two primers that are substantially complementary to the nucleotide sequences of the respective strands of the double-stranded nucleic acid and a DNA polymerase having a strand displacement activity to synthesize primer-extended strands that are complementary to the template and obtain a double-stranded nucleic acid consisting of the synthesized primer-extended strands being annealed each other, wherein each primer is a chimeric oligonucleotide primer containing a ribonucleotide as well as at least one selected from the group consisting of a deoxyribonucleotide and a nucleotide analog, the ribonucleotide being positioned at the 3'-terminus or on the 3'-terminal side of the primer;

(b) cleaving the sites that contain the ribonucleotide of the double-stranded nucleic acid consisting of the primer-extended strands obtained in step (a) with the endonuclease;

(c) extending nucleic acids that are complementary to the template using a DNA polymerase having a strand displacement activity from the 3'-termini of the respective primer portions of the double-stranded nucleic acid in which the primer-extended strands are cleaved obtained in step (b) to effect strand displacements and obtain a double-stranded nucleic acid

consisting of the primer-extended strands being annealed each other and a double-stranded nucleic acid consisting of the templates being annealed each other to which the two primers in step (a) are annealed;

(d) extending nucleic acids that are complementary to the template using a DNA polymerase having a strand displacement activity from the 3'-termini of the respective primer portions of the double-stranded nucleic acid to which the two primers are annealed obtained in step (c) to effect strand displacements and obtain a double-stranded nucleic acid consisting of the template and the primer-extended strand;

(e) cleaving the sites that contain the ribonucleotide of the double-stranded nucleic acid consisting of the template and the primer-extended strand obtained in step (d) with the endonuclease; and

(f) extending a nucleic acid that is complementary to the template using a DNA polymerase having a strand displacement activity from the 3'-terminus of the primer portion of the double-stranded nucleic acid in which the primer-extended strand is cleaved obtained in step (e) to synthesize a displaced strand.--

--317(New). A method for amplifying a nucleic acid, which comprises using a DNA polymerase having a strand displacement activity to effect a template switching reaction.--

--318(New). A chimeric oligonucleotide primer for detecting enterohemorrhagic Escherichia coli having a nucleotide

sequence selected from the group consisting of SEQ ID NOS: 31 to 34, 47, 48, 51-53, 64-72, 84, 85, 113, 114, 130 and 131.--

--319(New). A chimeric oligonucleotide primer for detecting a viroid having a nucleotide sequence selected from the group consisting of SEQ ID NOS: 59, 60, 119, 120, 122 and 123.--

--320(New). A chimeric oligonucleotide primer for detecting Clostridium botulinum having a nucleotide sequence represented by SEQ ID NO: 116 or 117.--

--321(New). A chimeric oligonucleotide primer for detecting papilloma virus having a nucleotide sequence represented by SEQ ID NO: 96 or 97.--

--322(New). A chimeric oligonucleotide primer for detecting hepatitis C virus having a nucleotide sequence selected from the group consisting of SEQ ID NOS: 101, 102, 138, 139, 200, 201, 205 and 206.--

--323(New). A chimeric oligonucleotide primer for detecting Staphylococcus aureus having a nucleotide sequence represented by SEQ ID NO: 136 or 137.--

--324(New). A chimeric oligonucleotide primer for detecting Mycobacterium tuberculosis having a nucleotide sequence selected from the group consisting of SEQ ID NOS: 155, 156, 159 to 162, 194 and 195.--

--325(New). A chimeric oligonucleotide primer for detecting Chlamydia having a nucleotide sequence selected from the group consisting of SEQ ID NOS: 157, 158, 203 and 204.--

--326(New). A product of a reagent for amplifying a nucleic acid consisting of a packing material and a reagent for amplifying a nucleic acid enclosed in the packing material, wherein the reagent for amplifying a nucleic acid contains a DNA polymerase having a strand displacement activity and/or an RNase H, and description that the reagent for amplifying a nucleic acid can be used for nucleic acid amplification under isothermal conditions is indicated in a label stuck to the packaging material or instructions attached to the packaging material.--

--327(New). A product of a reagent for amplifying a nucleic acid consisting of a packing material and a reagent for amplifying a nucleic acid enclosed in the packing material, wherein the reagent for amplifying a nucleic acid contains a DNA polymerase having a strand displacement activity and/or an endonuclease, and description that the reagent for amplifying a nucleic acid can be used for nucleic acid amplification under isothermal conditions is indicated in a label stuck to the packaging material or instructions attached to the packaging material.--

--328(New). A composition for amplifying a nucleic acid which contains:

(a) at least one primer that is substantially complementary to a nucleotide sequence of a nucleic acid as a template, wherein the primer is a chimeric oligonucleotide primer that contains a ribonucleotide as well as at least one selected from the group consisting of a deoxyribonucleotide and

a nucleotide analog, the ribonucleotide being positioned at the 3'-terminus or on the 3'-terminal side of the primer;

(b) an endonuclease; and

(c) a DNA polymerase having a strand displacement activity.--

--329(New). A composition for amplifying a nucleic acid which contains:

(a) at least two primers that are substantially complementary to nucleotide sequences of respective strands of a double-stranded nucleic acid as a template, wherein each primer is a chimeric oligonucleotide primer that contains a ribonucleotide as well as at least one selected from the group consisting of a deoxyribonucleotide and a nucleotide analog, the ribonucleotide being positioned at the 3'-terminus or on the 3'-terminal side of the primer;

(b) an endonuclease; and

(c) a DNA polymerase having a strand displacement activity.--

--330(New). A composition for amplifying a nucleic acid obtained by mixing a nucleic acid as a template, a deoxyribonucleotide triphosphate, a DNA polymerase having a strand displacement activity, at least one primer and an endonuclease, wherein the primer is a chimeric oligonucleotide primer that is substantially complementary to the nucleotide sequence of the nucleic acid as the template and contains a ribonucleotide as well as at least one selected from the group

consisiting of a deoxyribonucleotide and a nucleotide analog, the ribonucleotide being positioned at the 3'-terminus or on the 3'-terminal side of the primer.--

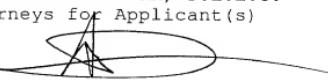
--331(New). A composition for amplifying a nucleic acid obtained by mixing a nucleic acid as a template, a deoxyribonucleotide triphosphate, a DNA polymerase having a strand displacement activity, at least two primers and an endonuclease, wherein each primer is a chimeric oligonucleotide primer that is substantially complementary to the nucleotide sequence of each strand of the double-stranded nucleic acid as the template and contains a ribonucleotide as well as at least one selected from the group consisiting of a deoxyribonucleotide and a nucleotide analog, the ribonucleotide being positioned at the 3'-terminus or on the 3'-terminal side of the primer.--

REMARKS

The above amendments to the claims are being made in order to place the application in better condition for examination.

Favorable consideration and allowance are earnestly solicited.

Respectfully submitted,
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